TRANSPORTABLE LIFE SUPPORT SYSTEM

The present invention is a stretcher-based mini-intensive care unit that incorporates resuscitative and life-sustaining capabilities into a universally adaptive platform for trauma management and unattended patient support. It allows the transport of medically unstable patients and fits into existing evacuation platforms.

BACKGROUND OF THE INVENTION

Since the end of World War I, the mortality rate for U.S. Army combat casualties is near 20% and has not changed significantly in spite of dramatic advances in medical technology. This is because 90% of all combat related deaths occur within the first hour after injury on the battlefield. One of the major goals of the Army's medical department is to decrease the mortality rate from combat injuries by providing the medical capability necessary to manage life threatening injuries. Thus, the transportable life support system was designed to project intensive care capability to assess and treat trauma victims as close to the site of injury as possible, provide mobile pre-operative and post-operative intensive care capability under extreme environmental conditions, and serve as a surgical platform.

Another major goal of the Army's medical department is to decrease the footprint of medical facilities on the battlefield. A significant portion of medical assests are currently consumed by post surgical patients, which according to current Army doctrine, must be stable prior to evacuation. This requirement results in a significant logistical burden to ground forces and is principally driven by the fact that there are no effective monitoring or therapeutic capabilities during ground or air transport which allow one to detect and respond to a life threatening medical emergency should one occur en route to a definitive care treatment facility. Thus, another goal of the transportable life support system is to decrease the medical footprint on the battlefield by providing the necessary therapeutic and physiologic monitoring capability needed to evaucate the potentially unstable patient.

In addition to battlefield applications, the transportable life support system can serve in the civilian sector as a medical assest during natural disasters or mass casualty scenarios where medical personnel and medical equipment resources are limited or not available.

Several stretcher based devices have been developed to enhance a caretaker's ability to monitor and treat patients in critical condition during transport or in remote areas where conventional medical assests are not available. For example, the MOBILE INTENSIVE CARE RESCUE FACILITY (MIRF) is a portable stretcher-based intensive care monitoring system designed by Buchanan Aircraft Corporation. It contains (i) a physiologic monitoring system, (ii) a ventilator, (iii) a volumetric infusion pump for fluid resuscitation, (iv) a syringe pump for drug administration, (v) a suction unit, (vi) a defibrillator, (vii) two oxygen tanks, and (viii) a battery power supply capable of maintaining stand-alone operation for 2 hours. The MIRF houses the medical equipment in a fiberglass bay which fits beneath the stretcher. The sides of the bay are open and allow access to the medical equipment.

Similar to the MIRF, the CARE FLIGHT STRETCHER BRIDGE for aeromedical transport of the critical care patient is a multi-story tray mounted to a stretcher. The unit contains 2 infusion pumps, a ventilator, a physiologic monitoring system, a defibrillator, an oxygen tank (6 cylinder with regulator), and a suction device. Additional resuscitation equipment is carried in an additional transport backpack.

Although similar in design, the MOBILE INTENSIVE CARE PATIENT HANDLING TRANSPORT APPARATUS (U.S. Pat. No. 4,957,121) was constructed to accomadate the needs of patients in heart failure requiring transport. It consists of a cot and a detachable pallet containing medical equipment that attaches underneath the framework of the cot. The medical equipment includes a power source with battery back-up, an intra-aortic balloon pump, a ventilator, an infusion pump, a physiologic monitoring system, a defibrillator, and a patient restraint system.

Another device designed for the transport of patients with severe cardiac illness is the HEART-LUNG RESUSCITATOR LITTER (U.S. Pat. No. 4,060,079) which is a portable stretcher that provides external chest compressions, oxygen, and an iv pole.

Simplified versions of the same type of equipment include the PORTABLE LIFE SUPPORT SYSTEM, (U.S. Pat. No. 4,352,991) and the RESCUE UNIT (U.S. Pat. No. 4,389,066). The PORTABLE LIFE SUPPORT SYSTEM contains a stretcher and a DC power supply. It may contain additional equipment to include a defibrillator, a suction device, components of an intravenous line, oxygen tank regulators, and a physiologic monitoring system. Similarly, the RESCUE UNIT is a vehicle that has beed built to be towed by snowmobile. The device contains a patient and attendant section and includes a suction unit, lights, first aid kit, battery power source, two way radio, heating element, horn, canopy to cover the patient, and patient call button.

While the above references are directed to providing stretcher based assitance to an injured patient, they do not provide the degree of medical care that the present invention does. In addition to physiological monitoring, ventilation, defibrillation, stand alone power, an oxygen source, and fluid infusion pumps, the life support system includes autonomous fluid resuscitation and ventilation that allow appropriate therapy to continue under conditions where trained personnel are not available.

Servo control systems for the delivery of fluid and medications have been well established as shown in APPARATUS FOR THE BIOFEEDBACK CONTROL OF BODY FUNCTIONS, U.S. Pat. No. 5,002,055, INFUSION PUMP CONTROLLER, U.S. Pat. No. 4,392,849, but they have not been a part of the stretcher based portable mini-intensive care unit as the present invention discloses. The transportable life support system also includes a communication system that allows remote control of diagnostic and therapeutic components of the system, if qualified personnel are not available on site; ability to fit within a variety of evacuation vehicles (fit within a 72" long by 22" wide by 18" high space) yet still allow access to medical equipment even if one or more sides of the base is blocked; size and weight constraints that make it manageable to carry with a patient in rough terrain; and an environmental control unit that filters and controls the temperature of circulating air.

With the canopy in place, the transportable life support system serves as a protected, temperature controlled pre-operative "waiting room", a post-operative intensive care unit before and during evacuation, and a protective barrier from biological and chemical agents while allowing patient treatment. Devices that provide contamination from life threatening substances (ANIT-CONTAMINATION MEANS, U.S. Pat. No. 4,736,762) and providing control of a patient's environment in a stretcher configuration (LIFE